

hundred and forty-two, or 11.73 per cent., were three-fourths verified; 2,893, or 76.78 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During October, 1883, two hundred and fifty-one cautionary signals were displayed. Of these, one hundred and eighty-one, or 72.1 per cent., were justified by winds of twenty-five miles, or more, per hour, at or within one hundred miles of the station. Forty-nine cautionary off-shore signals were displayed, of which number, thirty-nine, or 79.6 per cent., were fully justified. Of the ten off-shore signals which were not fully justified, seven were justified as to direction only, two were justified as to velocity only, and one was not justified either as to direction or velocity. Twelve "northwest" signals (displayed on the lakes) were ordered, all of which were justified as to direction, and nine, or 75.0 per cent., were justified both as to direction and velocity. Three hundred and twelve signals of all kinds were displayed, of which two hundred and twenty-nine, or 73.4 per cent., were fully justified. These do not include signals ordered at display stations, where the velocity is only estimated. Eleven signals were ordered late.

Sixty-six winds of twenty-five miles, or more, per hour were reported, for which no signals were ordered. Many of these were high local winds or strong sea-breezes.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at the Signal Service stations, during October, 1883, with the average depth at which the observations were made, are given in the table below. The highest water temperature observed during the month, 89°, occurred at Charleston, South Carolina, on the 1st; the lowest, 41° 5, occurred at Marquette, Michigan, on the 26th, 27th, and 29th. The largest monthly ranges are: 21° at Charleston, South Carolina; 18° at Cedar Keys, Florida; 17° 8 at Chincoteague, Virginia; 17° 6 at Fort Macon, North Carolina; 17° at Augusta, Georgia. The smallest monthly ranges are: 2° 9 at Eastport, Maine; 3° 4 at San Francisco, California, and 5° 3 at Duluth, Minnesota.

Temperature of Water for October, 1883.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	64.9	52.6	12.3	3 8	55.5
Alpena, Michigan.....	49.1	39.8	9.3	12 0	42.7
Augusta, Georgia.....	80.0	63.0	17.0	4 9	68.2
Baltimore, Maryland.....	66.5	57.0	9.5	10 0	57.5
Block Island, Rhode Island.....	61.5	51.3	10.2	8 7	52.4
Boston, Massachusetts.....	58.2	47.5	10.7	22 7	47.4
Buffalo, New York.....	58.8	51.3	7.5	10 2	48.4
Cedar Keys, Florida.....	87.4	69.4	18.0	11 9	76.3
Charleston, South Carolina.....	89.1	68.1	21.0	41 5	69.0
Chicago, Illinois.....	59.7	47.8	11.9	8 5	51.5
Chincoteague, Virginia.....	72.8	55.0	17.8	6 4	58.6
Cleveland, Ohio.....	60.3	50.0	10.3	14 0	51.6
Detroit, Michigan.....	59.6	47.0	12.6	22 8	50.8
Delaware Breakwater, Delaware.....	67.4	55.5	11.9	8 7	58.2
Duluth, Minnesota.....	50.7	45.4	5.3	15 6	44.1
Eastport, Maine.....	50.1	47.2	2.9	16 9	44.7
Escanaba, Michigan.....	77.6	60.0	17.6	5 3	65.2
Fort Macon, North Carolina.....	84.0	70.0	14.0	11 2	76.9
Galveston, Texas.....	57.9	45.8	12.1	19 0	47.6
Grand Haven, Michigan.....	83.0	60.5	6.5	8 9	76.8
Indianola, Texas.....	84.0	73.0	11.0	18 0	74.2
Jacksonville, Florida.....	87.0	79.0	8.0	17 8	79.5
Key West, Florida.....	54.6	46.9	7.7	10 0	44.7
Mackinaw City, Michigan.....	50.0	41.5	8.5	9 10	43.0
Marquette, Michigan.....	58.5	46.0	12.5	8 0	48.8
Milwaukee, Wisconsin.....	84.0	72.0	12.0	16 4	73.3
Mobile, Alabama.....	62.2	48.2	14.0	15 3	49.0
New Haven, Connecticut.....	63.0	52.0	11.0	13 4	50.9
New London, Connecticut.....	62.6	53.5	9.1	16 9	53.7
Norfolk, Virginia.....	71.3	57.8	13.5	18 4	62.2
Pensacola, Florida.....	83.6	71.4	12.2	17 2	72.2
Portland, Maine.....	54.5	47.0	7.5	17 11	48.2
Portland, Oregon.....	56.7	50.0	6.7	54 8	50.8
Provincetown, Massachusetts.....	61.0	48.0	13.0	11 10	50.1
Sandusky, Ohio.....	59.5	46.3	13.2	10 10	52.5
Sandy Hook, New Jersey.....	63.0	50.2	6.8	1 8	55.2
San Francisco, California.....	59.5	56.1	3.4	39 10	57.1
Savannah, Georgia.....	81.3	66.2	14.6	12 6	70.0
Smithville, North Carolina.....	79.2	64.2	15.0	10 0	65.7
Toledo, Ohio.....	59.5	46.6	12.9	11 10	51.8
Wilmington, North Carolina.....	72.8	63.5	9.3	21 0	66.0

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were observed during October as follows:

1st.—Johnson, Nebraska.

4th.—Gardiner, Maine.

5th.—This was the most brilliant display of the month; it was reported by the following stations: Block Island and Point Judith, Rhode Island; New Haven, Connecticut; Fall River, Taunton and Cambridge, Massachusetts; Eastport, Cornish and Gardiner, Maine; Newport, Vermont; Ithaca and Oswego, New York; Alexandria, Dakota.

6th.—Mount Washington, New Hampshire; Point Judith, Rhode Island; Gardiner Maine.

7th.—Johnson, Nebraska.

14th.—At Charleston, South Carolina, an aurora was reported to have been seen between 4 and 5 a. m., on the northern horizon. It resembled the electric light and was of sufficient intensity to show a bright radiance on the sides of the buildings.

15th.—Alpena, Michigan; Northfield, Minnesota.

16th.—Provincetown, Massachusetts; Mackinaw City and Escanaba, Michigan; Washington, District of Columbia.

18th.—Escanaba, Michigan.

19th.—Duluth, Minnesota.

24th.—Haverford College, Pennsylvania.

26th.—Mount Washington, New Hampshire.

ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC COMMUNICATION.

Logansport, Indiana, 8th.—Telegraphic communication was interrupted by atmospheric electricity on this date.

Fort Buford, Dakota.—A snow storm, which began at 8.45 p. m. of the 30th, was preceded by an electrical disturbance, which rendered telegraphic communication almost impossible. At times the electric current was so strong as to make it very difficult to adjust the instruments. When the snow began falling the current assumed its normal condition.

THUNDER-STORMS.

Thunder-storms were reported in the various districts on the following dates:

New England.—2d, 10th, 12th, 13th, 14th, 29th, 30th, 31st.

Middle Atlantic states.—1st, 2d, 10th, 13th, 14th, 23d, 29th.

South Atlantic states.—1st to 4th, 6th, 14th, 15th, 16th, 21st, 28th, 29th, 30th.

Florida peninsula.—4th to 7th, 13th, 15th to 19th, 21st, 22d, 29th, 30th.

Eastern Gulf.—1st, 2d, 9th, 13th, 14th, 16th, 18th to 22d, 28th, 29th.

Western Gulf.—1st, 2d, 3d, 5th, 6th, 9th to 22d, 24th, 26th to 29th.

Tennessee.—1st, 2d, 3d, 5th, 6th, 10th, 11th, 16th, 18th, 27th, 28th, 29th.

Ohio valley.—1st, 2d, 4th, 5th, 6th, 9th, 10th, 11th, 13th, 27th, 28th, 29th.

Lower lakes.—2d, 9th, 10th, 12th, 13th, 19th, 29th, 30th.

Upper lakes.—1st, 5th to 10th, 17th, 28th, 29th.

Upper Mississippi valley.—1st, 2d, 4th to 11th, 17th, 18th, 19th, 27th, 28th, 29th.

Missouri valley.—1st to 13th, 16th to 19th, 26th, 28th, 29th.

Middle slope.—1st, 7th, 12th, 16th, 17th, 20th, 22d, 27th, 28th.

Southern slope.—1st to 6th, 8th to 12th, 16th, 17th, 22d, 27th.

Southern plateau.—2d, 6th to 11th, 15th, 16th, 29th 30th.

Thunder-storms were also reported from the following stations not included in the districts named above:

Princeton, California, 1st, 7th.

Salt Lake City, Utah, 4th.

Sacramento, California, 5th.

Moorhead, Minnesota, 5th, 7th.

Fort Meade, Dakota, 7th.

North Platte, Nebraska, 7th.

Rio Grande City, Texas, 13th, 19th, 20th, 21st, 24th.

Cheyenne, Wyoming, 16th.
Uncompahgre, Colorado, 16th.
Genoa, Nebraska, 17th.
Red Bluff, California, 24th.
Fort Canby, Washington Territory, 27th.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various states and territories on the following dates:

Arkansas.—Lead Hill, 10th, 13th, 16th, 23d, 28th.
California.—San Francisco, 3d, 7th, 11th, 27th, 31st; Poway, 22d; Cape Mendocino, 30th.
Dakota.—Fort Buford, 9th, 27th; Webster, 12th, 19th, 20th.
Florida.—Key West, 5th, 8th, 14th; Archer, 13th, 30th.
Georgia.—Augusta, 15th, 20th.
Illinois.—Cairo, 11th; Polo, 17th, 18th; Chicago, 30th.
Kansas.—Holton, 7th; Independence, 10th; Yates Centre, 10th.
Maine.—Cornish, 23d; Gardiner, 23d.
Massachusetts.—Provincetown, 23d.
Michigan.—Swartz Creek, 4th; Marquette, 9th; Grand Haven, 24th.
Minnesota.—Northfield, 4th.
Nebraska.—Johnson, 7th.
Nevada.—Carson City, 27th.
New Hampshire.—Grafton, 3d; Mount Washington, 8th, 23d.
New York.—Palermo, 28th.
North Carolina.—Fort Macon, 11th; Cape Lookout, 28th.
Ohio.—Wauseon, 3d, 4th; Toledo, 4th.
Tennessee.—Chattanooga, 4th; Nashville, 28th.
Texas.—Indianola, 21st; Palestine, 23d; Fort Davis, 31st.
Utah.—Salt Lake City 19th.
Vermont.—Lunenburg, 10th, 30th; Strafford, 23d.
Virginia.—Variety Mills, 27th, 28th.
Wisconsin.—Manitowoc, 4th.

LUNAR HALOS.

Lunar halos have been observed in the various states and territories on the following dates:

Alabama.—Auburn, 11th, 15th; Mobile, 15th.
Arizona.—Prescott, 12th; Fort Apache, 21st.
Arkansas.—Lead Hill, 10th; Fort Smith, 10th, 12th.
California.—Los Angeles, 11th, 16th, 21st; San Diego, 20th, 22d.
Colorado.—Uncompahgre, 12th.
Dakota.—Webster, 9th; Fort Bennett, 10th; Fort Meade, 13th.
Florida.—Limona, 12th, 14th.
Georgia.—Augusta, 12th; Atlanta, 18th.
Illinois.—Cairo, 8th, 9th, 10th, 13th, 17th, 18th; Chicago, 10th, 17th; Polo, 10th; Riley, 10th; Springfield, 10th, 16th.
Indiana.—Wabash, 9th, 17th.
Iowa.—Humboldt, 10th; Dubuque, 16th; Guttenburg, 16th; Manchester, 16th; Monticello, 16th; Indianola, 17th.
Kansas.—Yates Centre, 8th, 10th; Independence, 10th; Fort Scott, 10th, 17th; Clay Centre, 14th.
Kentucky.—Frankfort, 12th; Louisville, 12th.
Maine.—Gardiner, 8th; Eastport, 18th.
Massachusetts.—Boston, 8th; Dudley, 8th.
Michigan.—Alpena, 11th; Port Huron, 12th; Kalamazoo, 16th; Swartz creek, 17th.
Minnesota.—Saint Paul, 12th.
Mississippi.—Vicksburg, 8th.
Missouri.—Curryville, 19th.
Nebraska.—Johnson, 7th.
Nevada.—Carson City, 11th.
New Hampshire.—Mount Washington, 8th.
New Jersey.—Freehold, 8th, 9th, 11th, 16th; Moorestown, 10th, 25th; Barnegat City, 14th, 19th, 20th.
New York.—Menand Station (near Albany), 9th.
North Carolina.—Cape Lookout, 9th, 10th; Fort Macon, 11th.

Ohio.—Columbus, 11th; Cincinnati, 12th; Wauseon, 18th.
Oregon.—Portland, 15th.
Pennsylvania.—Fallsington, 11th; Chambersburg, 30th.
Tennessee.—Milan, 12th; Memphis, 13th.
Texas.—Galveston, 3d, 7th, 17th; Indianola, 4th to 8th, 10th, 11th, 12th, 15th, 16th, 18th; Fort Stockton, 10th, 15th, 16th.

Utah.—Salt Lake City, 18th, 19th, 25th.

Vermont.—Strafford, 10th.

Virginia.—Norfolk, 10th; Wytheville, 10th; Johnstown, 12th, 13th.

Washington Territory.—Spokane Falls, 9th; Fort Canby, 10th, 23d; Dayton, 11th, 12th.

Wisconsin.—Franklin, 8th; Grand Haven, 10th; Milwaukee, 14th; Beloit, 14th, 16th; La Crosse, 16th.

MIRAGE.

Indianola, Texas, 20th, 25th, 30th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and fifty-two stations show 4,610 observations to have been made, of which twenty-one were reported doubtful; of the remainder, 4,589, there were 3,852, or 83.9 per cent., followed by the expected weather.

SUN SPOTS.

The following record of sun spots for the month of October, 1883, has been forwarded by Professor D. P. Todd, Director of the Lawrence observatory, Amherst, Massachusetts:

Date— Oct., 1883.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 4 p. m.	2	2					2	2	
3, 10 a. m.	1	3	0	0			3	5	
4, 9 a. m.	0	4	1	1	0	0	2	8	
5, 12 m.	2	6	0	0	1	2	4	13	
6, 3 p. m.	1	1	0	0	1	1	5	14	
7, 4 p. m.	2	15	0	0	1	5	7	30	Also veiled spots.
8, 10 a. m.	0	0	1	1	0	0	0	30	
9, 3 p. m.	1	15	0	0	1	1	7	45	
10, 12 m.	0	20	0	0	0	0	7	70	
11, 11 a. m.	1	15	0	0	0	0	8	85	Two of spots quite large.
13, 12 m.	1	10			1	10	5	65	
14, 2 p. m.	0	5	0	0	0	5	5	70	
15, 10 a. m.	2	10	0	5	0	0	7	75	
16, 3 p. m.	0	0	1	5	0	0	6	70	
17, 12 m.	0	0	0	10	0	0	6	60	
18, 4 p. m.	0	0	2	25	0	0	4	30	
22, 5 p. m.	1	2					3	15	
28, 10 a. m.							7	50	
30, 2 p. m.	0	0	2	15	0	0	5	35	
31, 3 p. m.	1	2	0	0	1	2	6	35	

Faculae were seen at the time of every observation. 1 Approximated.

Mr. William Dawson, of Spiceland, Indiana, observed sun-spots during October as follows:

1st.—Two groups, four spots, three of which were near the east edge; all prominent; air very poor.

7th.—Seven groups, sixty-five spots; a large oblong spot near east edge; a row of groups across the sun.

8th.—Seven groups, seventy-one spots; much faculae.

9th.—Six groups, one hundred and thirty-five spots; many of the latter were large. Eighty-eight spots were counted with 50 eye-piece.

13th.—Six groups, seventy (?) spots, observed with 50 eye-piece through cloud.

14th.—Six groups, ninety spots, observed with 50 eye-piece. Two large groups were near the west side, and one near the east edge.

15th.—Six groups, one hundred and fifty spots, observed with 100 eye-piece. There were sixty-five spots in one group near the west edge.

19th.—One spot was distinctly seen through cloud without the telescope.